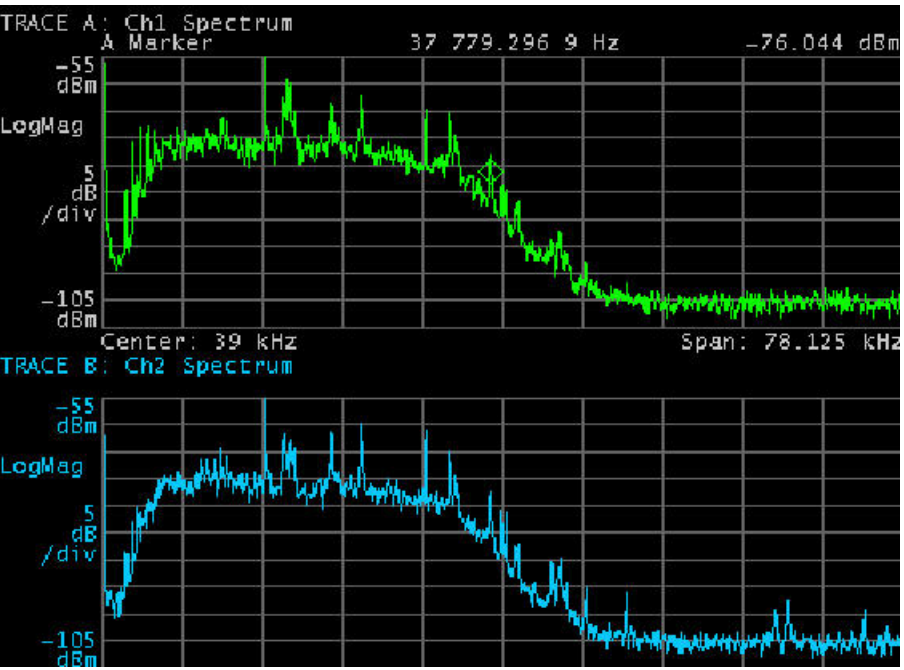
Background

- Dynamic range at transition was showstopper for the 245MHz PLL
- 3D AFE and BBQ appeared to be the solution to this problem
  - Large dynamic range of the diodes – they are the first component in the signal path
  - ~160dB suppression of the revolution line plus ~10nm sensitivity
- However, BBQ operates in the coherent spectrum
  - We discover mains harmonics, which are ~50dB more severe in RHIC than Tevatron or SPS
  - We discover the 'anomalous BTF' at injection with ions
  - No obvious solution on the horizon for either of these problems in the coherent spectrum (although there is an APEX proposal to study the anomalous BTF)
  - they both are solid obstacles to making tune feedback operational
- So how about a 'hybrid' system? Direct diode detection of 245MHz pickup
  - preliminary data taken in Run 7 was promising

no deliberate beam excitation

Comparison of 3D AFE Signals from 1m BBQ stripline and resonant 245MHz pickup

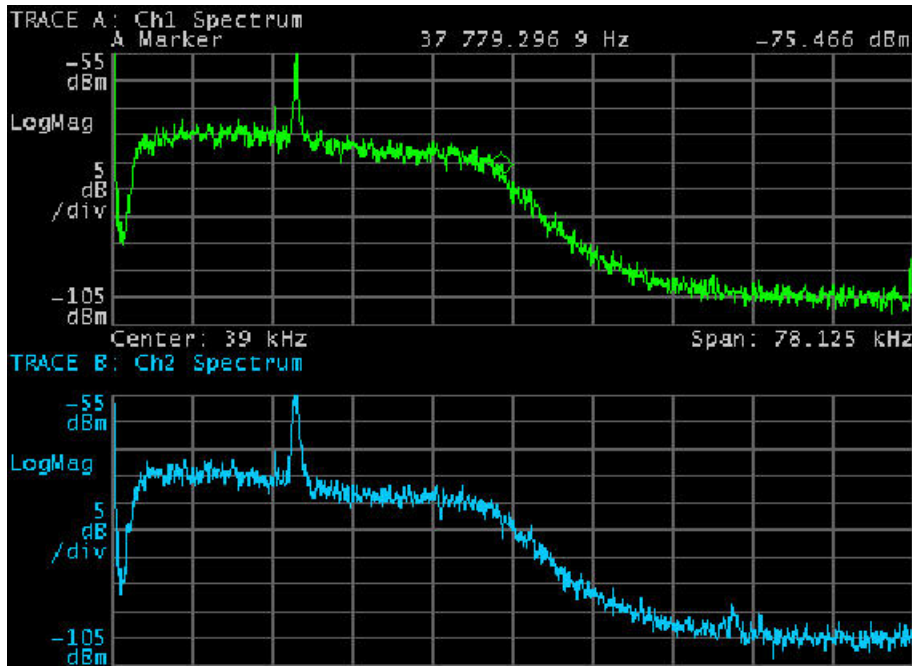
BBQ



H

V

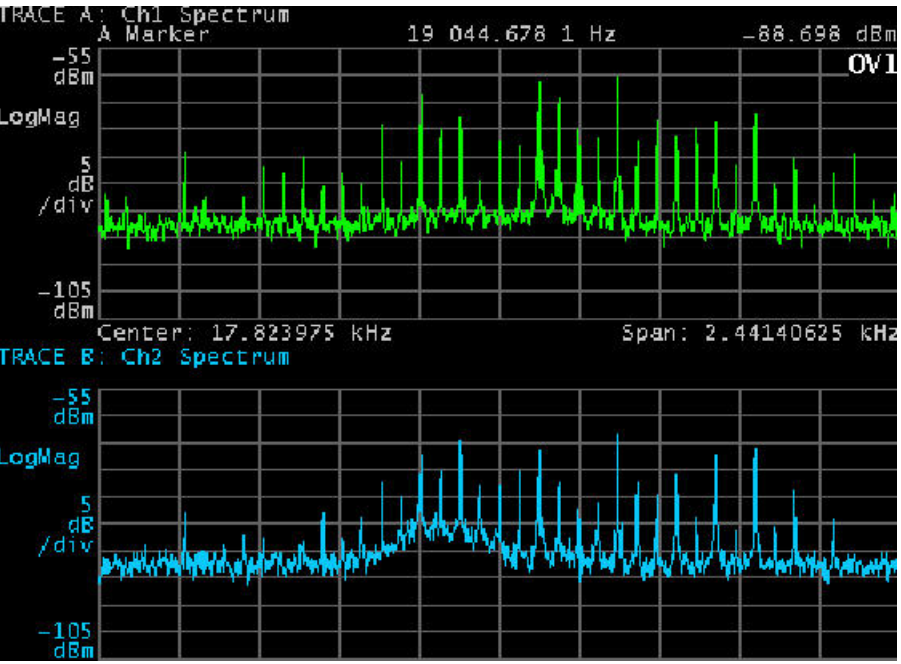
hybrid/245MHz



no deliberate beam excitation

Zoom on Betatron Line of Previous Slide

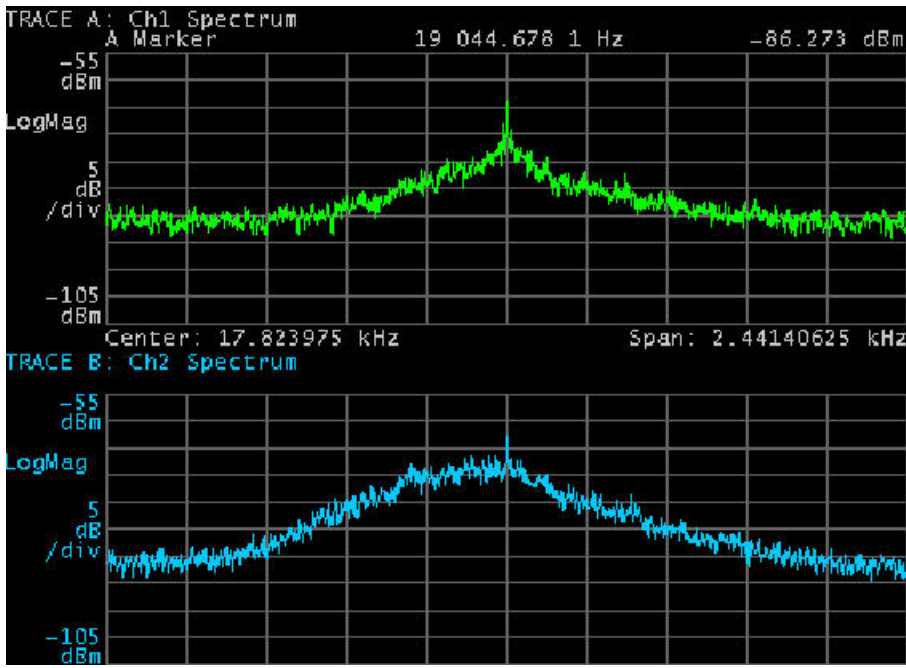
BBQ

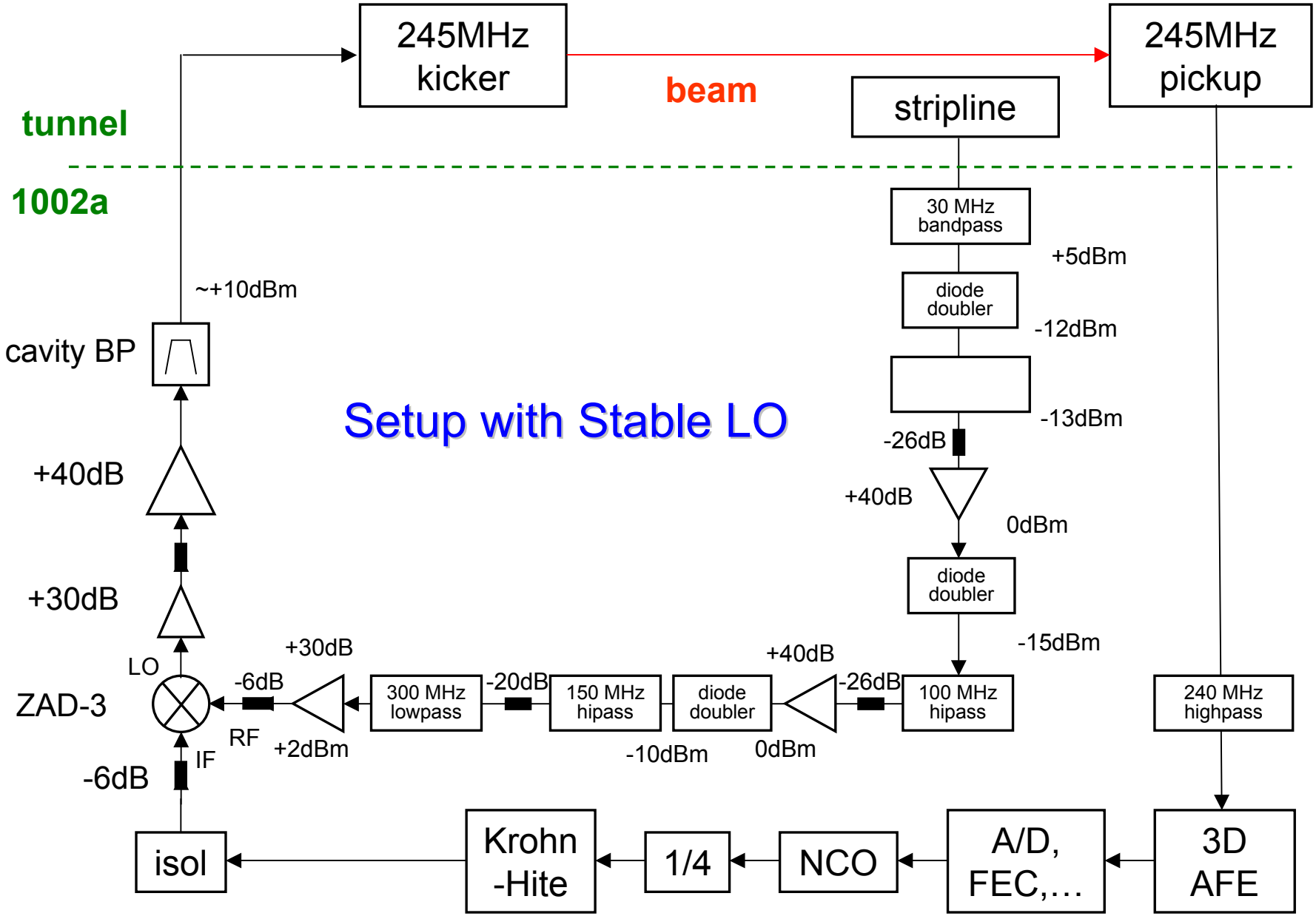


H

V

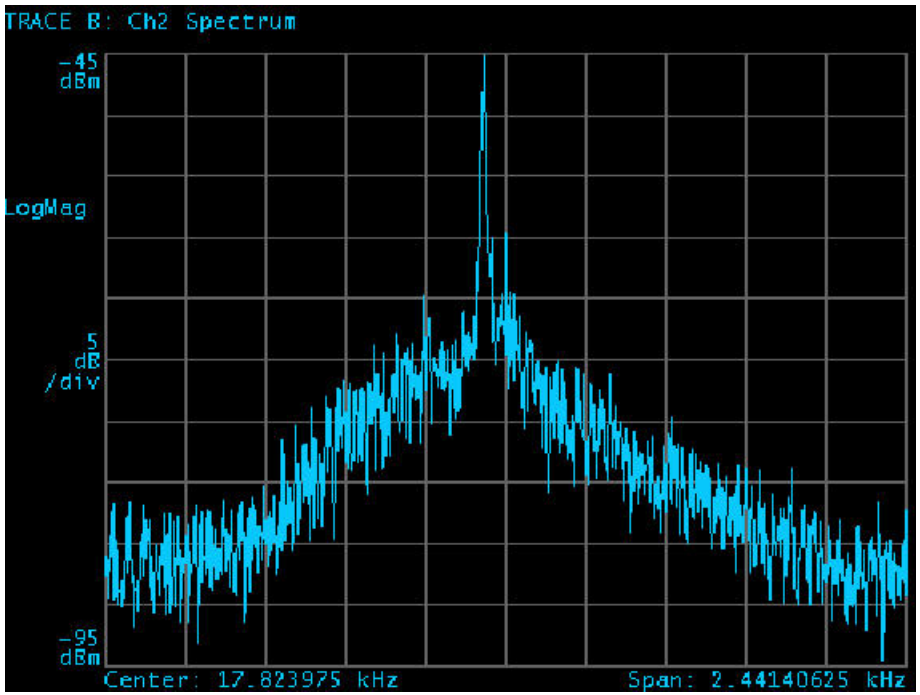
hybrid/245MHz



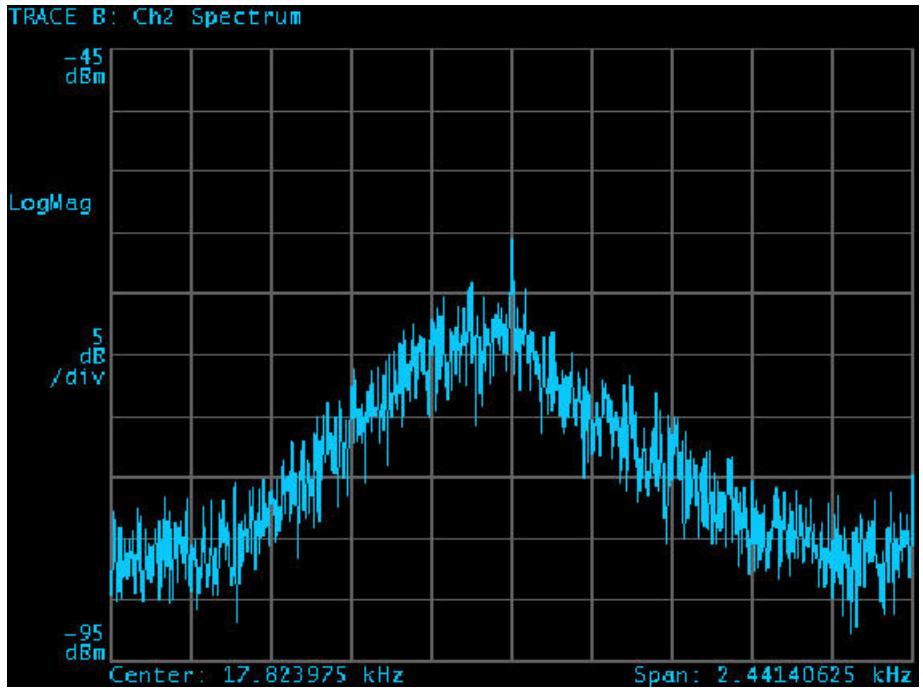

245MHz kicker
beam
245MHz pickup
tunnel
stripline
1002a
30 MHz bandpass
+5dBm
diode doubler
-12dBm
-13dBm
-26dB
+40dB
0dBm
diode doubler
-15dBm
~+10dBm
cavity BP
Setup with Stable LO
+40dB
+30dB
LO
ZAD-3
+30dB
-6dB
RF
+2dBm
300 MHz lowpass
-20dB
150 MHz hipass
diode doubler
-10dBm
+40dB
0dBm
-26dB
100 MHz hipass
240 MHz highpass
-6dB
IF
isol
Krohn -Hite
1/4
NCO
A/D, FEC,…
3D AFE

Betatron Line with and w/o Excitation

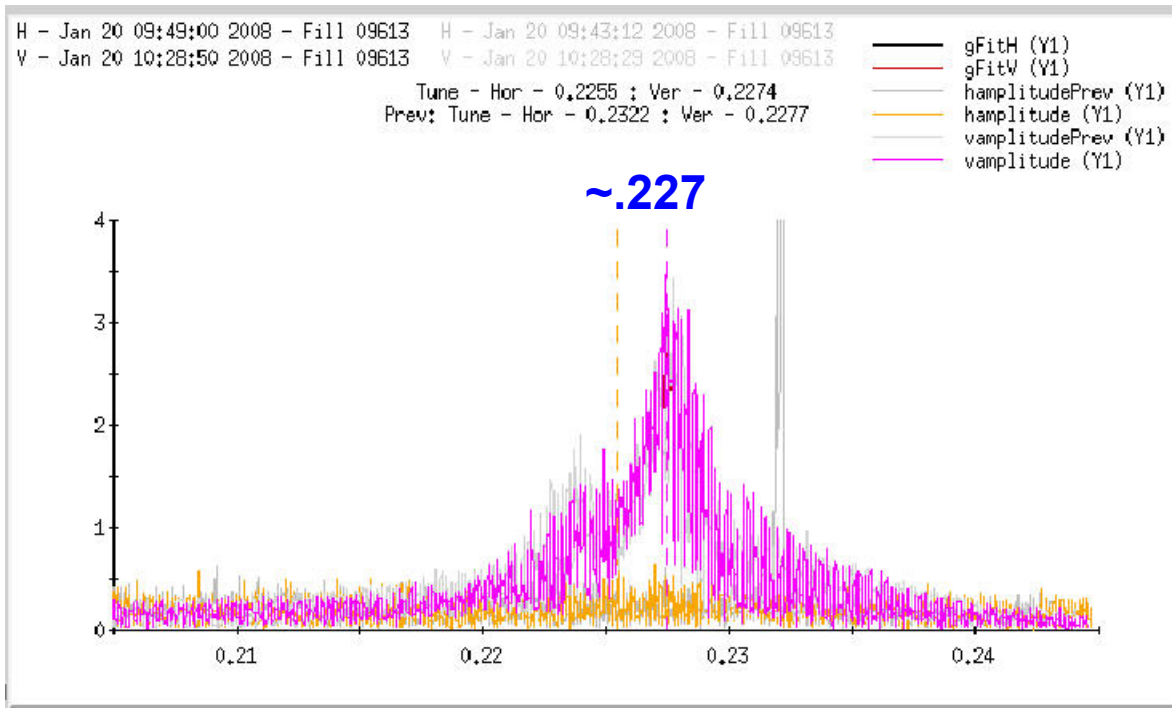
with ~20dB kick



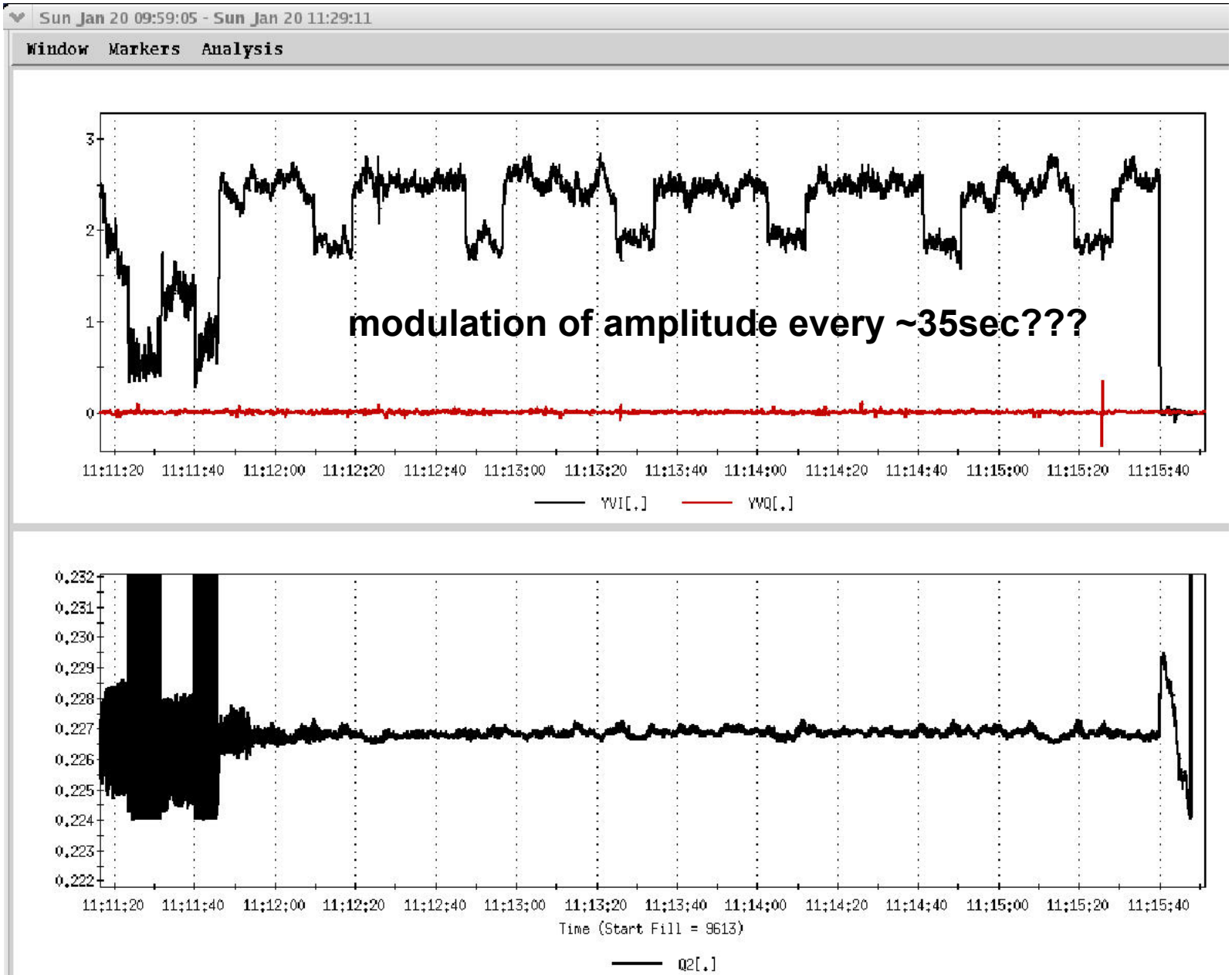
without kick



BTF with Hybrid Tracker

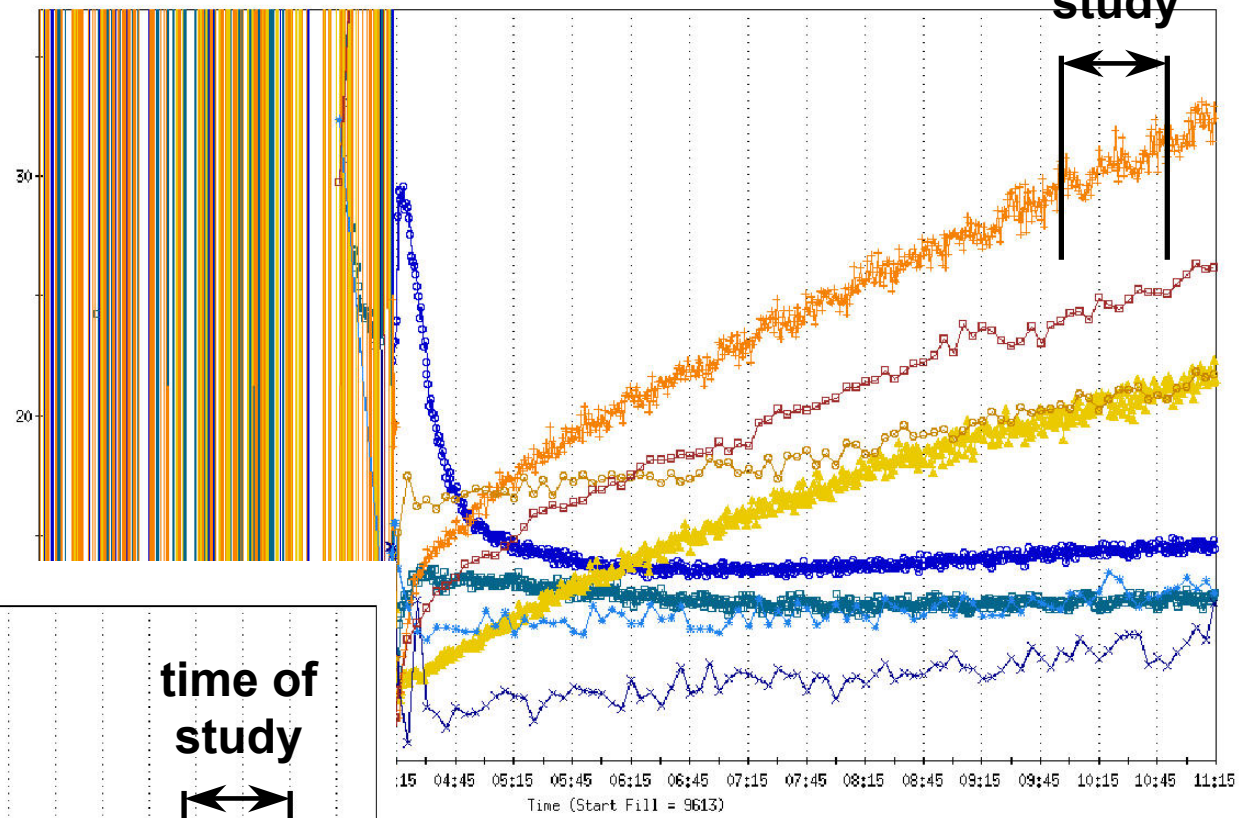


Tune and Amplitude & Phase

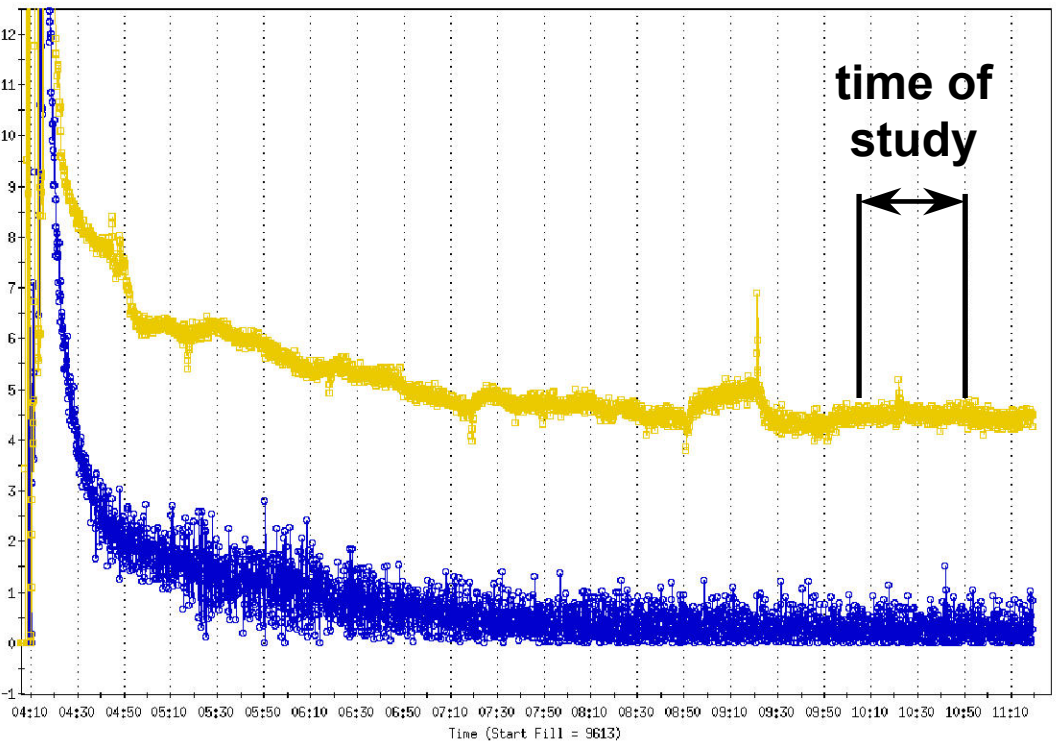


~.227

no perceptible beam decay or emittance growth



Beam Decay



Summary

- Preliminary study Dec 30th, parasitic to a RHIC store
  - used the 245MHz signal as LO for mixer chain
  - good beam transfer function measurements
  - good tune tracking
  - no emittance growth
- APEX study Jan 16th
  - used multiplied signal from 1m stripline as LO
  - not able to drive the beam
- Parasitic study Jan 20th, behind a RHIC store – see BBQ elog for details
  - debugged the kicker chain, resolved mixup of pickup planes,…
  - good beam transfer function measurements
  - good tune tracking
  - no emittance growth
  - preliminary measurement of system bandwidth using the 10Hz cryostat vibration line – equal to or better than existing BBQ
- Ready for APEX study
- Ready for ramps?